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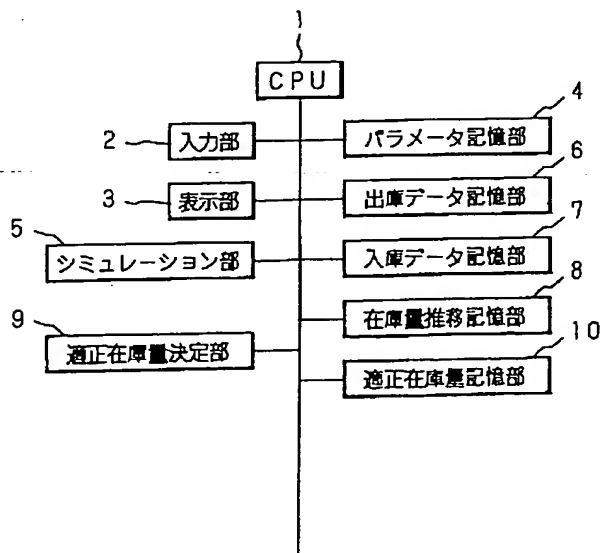
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(54) 【発明の名称】 適正在庫量決定方法及び適正在庫量決定装置並びに記録媒体

(57) 【要約】

【課題】 オペレータの経験に拘らず、適正在庫量を短時間で決定することができる適正在庫量決定方法、及びその実施に使用する装置、並びにそのコンピュータプログラムが記録してある記録媒体を提供する。

【解決手段】 適正在庫量決定部9は、在庫量推移記憶部8に記憶してある日々の在庫量から、在庫量閾値以下のものを抽出し、その値が小さいものから順に並べ替える一方、係数Tを算出する。適正在庫量決定部9は、各品切れ率の別に安全在庫量をそれぞれ算出すると共に、出庫データ記憶部6を参照して発注サイクル内の総出庫量を算出し、両者を加算して適正在庫量を算定する。



【特許請求の範囲】

【請求項 1】 製品の出入庫に係る実績から算出したパラメータを用い、予め設定した単位期間毎の在庫量をシミュレーションによってそれぞれ演算し、得られた複数の在庫量の内の在庫量が予め定めた閾値より少ない第 1 期間を求め、得られた第 1 期間が予め定めた第 2 期間内になるように適正在庫量を決定する方法において、前記シミュレーションによって得た複数の在庫量から、前記閾値より少ない在庫量を抽出し、抽出した在庫量をその値が小さい順番又は大きい順番に並べ替えて在庫量配列を形成する一方、前記第 2 期間に含まれる単位期間の数から係数を求め、前記在庫量配列に含まれる各在庫量から、前記係数に対応する順番の在庫量を選択し、選択した在庫量と閾値との差及び前記実績を用いて適正在庫量を決定することを特徴とする適正在庫量決定方法。

【請求項 2】 製品の出入庫に係る実績から算出したパラメータを用い、予め設定した単位期間毎の在庫量をシミュレーションによってそれぞれ演算し、得られた複数の在庫量の内の在庫量が予め定めた閾値より少ない第 1 期間を求め、得られた第 1 期間が予め定めた第 2 期間内になるように適正在庫量を決定する装置において、前記シミュレーションによって得た複数の在庫量から、前記閾値より少ない在庫量を抽出する手段と、抽出した在庫量をその値が小さい順番又は大きい順番に並べ替えて在庫量配列を形成する手段と、前記第 2 期間に含まれる単位期間の数から係数を求める手段と、在庫量配列に含まれる各在庫量から、前記係数に対応する順番の在庫量を選択する手段と、選択した在庫量と閾値との差及び前記実績を用いて適正在庫量を決定する手段とを備えることを特徴とする適正在庫量決定装置。

$$\text{適正在庫量} = \alpha \times \sqrt{(L + M) \times \sigma + D} \quad \dots (1)$$

α : 許容される品切れ期間によって定まる係数

L : 製品発注から製品入庫までの期間である調達期間

M : 製品発注から次の製品発注までの期間である発注サイクル

σ : 在庫量のばらつき (標準偏差)

D : 発注サイクル内の平均在庫量

【0003】しかし、このような数式を用いて適正在庫量を算出する方法では、調達期間又は出入庫の数量及び時期等が変化する場合を考慮しておらず、そのような場合、適切な適正在庫量を算出することができなかった。

【0004】そのため、特開平 5-81301 号公報には次のような方法が開示されている。調達期間又は出入庫の数量及び時期等の各実績値からシミュレーションに用いる複数のパラメータを求める。また、仮の適正在庫量及びシミュレーション実施期間を設定する。仮の適正在庫量及び各パラメータに基づいて、在庫量の推移をシミュレートし、得られた結果から品切れが発生した期間（以後、品切れ期間という）を求め、シミュレーション実施期間に対する品切れ期間の割合である品切れ率を算出す

* 【請求項 3】 製品の出入庫に係る実績から算出したパラメータを用い、予め設定した単位期間毎の在庫量をシミュレーションによってそれぞれ演算させるステップと、該シミュレーションによって得られた複数の在庫量から、予め定められた閾値より少ない在庫量を抽出させるステップと、抽出された在庫量をその値が小さい順番又は大きい順番に並べ替えさせて在庫量配列を形成させるステップと、抽出された在庫量の数から求まる第 1 期間を予め定めた第 2 期間内にすべく、該第 2 期間に含まれる単位期間の数から係数を求めさせるステップと、前記在庫量配列に含まれる各在庫量から、前記係数に対応する順番の在庫量を選択させるステップと、選択された在庫量と閾値との差及び前記実績を用いて適正在庫量を決定させるステップとを有するコンピュータプログラムが記録してあることを特徴とする記録媒体。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、在庫管理の基準値である適正在庫量を決定する方法、及びその実施に使用する装置、並びそのコンピュータプログラムを記録した記録媒体に関する。

【0002】

【従来の技術】製品の出庫量に応じて当該製品を発注・入庫し、製品の在庫量を管理する在庫管理では、在庫の製品が無くなる、所謂品切れが発生する期間が、零日～数日等、製品の種類に応じて許容され得る許容期間内であって、入庫直後の在庫量が可及的に少い適正在庫量を短時間で決定することが重要である。そのような適正在庫量を決定する方法として、次の (1) 式を用いて適正在庫量を算出する方法が提案されている。

算出した品切れ率が予め設定した閾値と略等しいか否かを判断し、品切れ率が閾値と略等しくないと判断した場合、仮の適正在庫量を変更し、再びシミュレーションを行って品切れ率を算出する。このような操作を品切れ率が閾値と略等しいと判断するまで繰り返し、品切れ率が閾値と略等しいと判断した場合、仮の適正在庫量を適正在庫量に決定する。

【0005】

【発明が解決しようとする課題】しかしながら、特開平 5-81301 号公報に開示された方法にあつては、シミュレーションを繰り返して試行錯誤的に適正在庫量を決定するため、適正在庫量を決定するまでに長時間を要するという問題があった。また、シミュレーションに用いる仮の適正在庫量は、前述した各実績値に基づいてオペレータが経験的に適当な値を設定するため、経験が浅いオペレータの場合、適正在庫量を決定するまでに更に長時間を要する。

【0006】本発明はかかる事情に鑑みてなされたものであつて、その目的とするところはシミュレーションに

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よって得た複数の在庫量の内の閾値より少ない在庫量をその値が小さい順番又は大きい順番に並べ替えて在庫量配列を形成する一方、第2期間に含まれる単位期間の数から係数を求め、在庫量配列に含まれる各在庫量から、前記係数に対応する順番の在庫量を選択し、選択した在庫量と閾値との差及び入出庫に係る実績を用いて適正在在庫量を決定することによって、調達期間又は入出庫の数量及び時期等が変化する場合でも、オペレータの経験に拘らず、適正在在庫量を短時間で決定することができる適正在在庫量決定方法、及びその実施に使用する装置、並びにそのコンピュータプログラムが記録してある記録媒体を提供することにある。

【0007】

【課題を解決するための手段】第1発明に係る適正在在庫量決定方法は、製品の入出庫に係る実績から算出したパラメータを用い、予め設定した単位期間毎の在庫量をシミュレーションによってそれぞれ演算し、得られた複数の在庫量の内の在庫量が予め定めた閾値より少ない第1期間を求め、得られた第1期間が予め定めた第2期間内になるように適正在在庫量を決定する方法において、前記シミュレーションによって得た複数の在庫量から、前記閾値より少ない在庫量を抽出し、抽出した在庫量をその値が小さい順番又は大きい順番に並べ替えて在庫量配列を形成する一方、前記第2期間に含まれる単位期間の数から係数を求め、前記在庫量配列に含まれる各在庫量から、前記係数に対応する順番の在庫量を選択し、選択した在庫量と閾値との差及び前記実績を用いて適正在在庫量を決定することを特徴とする。

【0008】第2発明に係る適正在在庫量決定装置は、製品の入出庫に係る実績から算出したパラメータを用い、予め設定した単位期間毎の在庫量をシミュレーションによってそれぞれ演算し、得られた複数の在庫量の内の在庫量が予め定めた閾値より少ない第1期間を求め、得られた第1期間が予め定めた第2期間内になるように適正在在庫量を決定する装置において、前記シミュレーションによって得た複数の在庫量から、前記閾値より少ない在庫量を抽出する手段と、抽出した在庫量をその値が小さい順番又は大きい順番に並べ替えて在庫量配列を形成する手段と、前記第2期間に含まれる単位期間の数から係数を求める手段と、在庫量配列に含まれる各在庫量から、前記係数に対応する順番の在庫量を選択する手段と、選択した在庫量と閾値との差及び前記実績を用いて適正在在庫量を決定する手段とを備えることを特徴とする。

【0009】第3発明に係る記録媒体は、製品の入出庫に係る実績から算出したパラメータを用い、予め設定した単位期間毎の在庫量をシミュレーションによってそれぞれ演算させるステップと、該シミュレーションによって得られた複数の在庫量から、予め定められた閾値より少ない在庫量を抽出させるステップと、抽出された在庫

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量をその値が小さい順番又は大きい順番に並べ替えさせて在庫量配列を形成させるステップと、抽出された在庫量の数から求まる第1期間を予め定めた第2期間内にすべく、該第2期間に含まれる単位期間の数から係数を求めさせるステップと、前記在庫量配列に含まれる各在庫量から、前記係数に対応する順番の在庫量を選択させるステップと、選択された在庫量と閾値との差及び前記実績を用いて適正在在庫量を決定させるステップとを有するコンピュータプログラムが記録してあることを特徴とする。

【0010】本発明にあつては、製品の入出庫に係る実績から算出したパラメータを用い、予め設定した単位期間毎の在庫量をシミュレーションによってそれぞれ演算し、得られた複数の在庫量から、閾値より少ない在庫量を抽出する。シミュレーションを行う場合、仮の適正在在庫量は設定せずに、入出庫による在庫量の推移を求める。従つて、オペレータの経験に拘らず、迅速にシミュレーションを行うことができる。

【0011】抽出した在庫量の数に単位期間を乗算して求まる第1期間（品切れ期間）を予め定めた第2期間（許容期間）内にすべく、抽出した在庫量をその値が小さい順番又は大きい順番に並べ替えて在庫量配列を形成し、在庫量配列に含まれる複数の在庫量から所要の在庫量を次のように選択する。例えば、在庫量の値が小さい順番に並べ替えた場合、単位期間を n 回累計した値が予め定めた第2期間（許容期間）を越える最小の係数 n を求め、先頭から n 番目の在庫量を選択する。

【0012】選択した在庫量と閾値との差を算出し、それを、製品が入庫してから次に製品が入庫されるまでの間の出庫量に加算して得られた在庫量を適正在在庫量に決定する。この適正在在庫量によって在庫管理を行った場合、在庫量配列の先頭から n 番目の在庫量は閾値より大きな値になる。このように、在庫量が閾値より少ない期間を許容期間内になすことができる最小の在庫量である適正在在庫量を1回のシミュレーションで求めることができ、適正在在庫量が短時間で決定される。

【0013】

【発明の実施の形態】以下、本発明の実施の形態を図面に基つて具体的に説明する。図1は本発明に係る適正在在庫量決定装置の要部構成を示すブロック図であり、図2は、図1に示した適正在在庫量決定装置による適正在在庫量の決定手順を示すフローチャートである。キーボード又はマウス等の入力部2から、シミュレーション実施期間、調達期間、入出庫の数量及び時期等の各実績値から求めた複数のパラメータ、シミュレーション開始時の在庫量（現在の在庫量）、発注サイクル、及び直近の発注日等が入力されると、CPU1は、それらをパラメータ記憶部4に与え、そこに記憶させる（ステップS1）と共にシミュレーション部5を起動して在庫量の推移を演算させる（ステップS2）。

【0014】前述した各パラメータは複数の実績値に基づいて次のように求める。複数回発注した製品の発注量と入庫量との比をそれぞれ求め、求めた比の平均及び標準偏差を算出し、それらを入庫量パラメータとする。また、製品を発注してから入庫されるまでの期間の平均及び標準偏差を算出し、それらを入庫タイミング（調達期間）パラメータとする。一方、複数回出庫した製品の出庫量の平均及び標準偏差を算出し、それらを出庫量パラメータとする。また、在庫管理の単位期間内の出庫回数の平均及び標準偏差を算出し、それらを出庫タイミングパラメータとする。

【0015】図3は、図1に示したシミュレーション部5による在庫量推移の演算手順を示すフローチャートであり、製品の発注を定期的に行う定期発注方式による場合を示している。シミュレーション部5は、パラメータ記憶部4から出庫タイミングパラメータを読み込み、そ*

(発注量) = (発注日から入庫日までの予測出庫量) - (現在の在庫量)

- (発注済製品の未入庫量) + (在庫量閾値) … (2)

但し、在庫量閾値：在庫量が負にならないように予め設定した十分大きな値

【0017】シミュレーション部5は、パラメータ記憶部4から入庫量パラメータ及び入庫タイミングパラメータを読み込み、(2)式を用いて算出した発注量及び入庫量パラメータから入庫量を算出すると共に、入庫タイミングパラメータに基づいて入庫日を算出し(ステップS25)、算出した入庫量及び入庫日に対応付けて入庫デ※

(当日の在庫量) = (前日の在庫量) - (当日の出庫量) + (当日の入庫量)

… (3)

【0019】シミュレーション部5は、シミュレーション期間の終了日か否かを判断し(ステップS29)、そうでない場合、日付を1日更新し(ステップS30)で、ステップS23へ戻る。シミュレーション部5は、ステップS23でシミュレーション期間の終了日であると判断するまで、ステップS24～ステップS30までの操作を繰り返すことによって、シミュレーション期間における在庫量の推移を演算する。

【0020】このようにして、在庫量の推移が得られると、CPU1は適正在庫量決定部9を起動する。適正在★

$\min. T > (\text{シミュレーション実施期間}) \times (\text{品切れ率})$ … (4)

但し、T：整数

【0021】適正在庫量決定部9は、次の(5)式に基づいて、各品切れ率の別に安全在庫量をそれぞれ算出する(ステップS8)と共に、出庫データ記憶部6を参照☆

(安全在庫量) = (在庫量閾値) - (ソート済在庫量配列のT番目の在庫量) … (5)

(適正在庫量) = (安全在庫量) + (発注サイクル内の総出庫量の平均) … (6)

【0022】(5)式によって求めた安全在庫量を用いて算定した適正在庫量で在庫管理を行った場合、ソート済在庫量配列のT番目の在庫量は在庫量閾値より大きい

*の平均及び標準偏差内で乱数を発生し、シミュレーション実施期間に含まれる複数の単位期間毎、例えば日毎の出庫回数を生成する。そして、シミュレーション部5は、パラメータ記憶部4から出庫量パラメータを読み込み、読み込んだ出庫量パラメータを用いて日毎の出庫回数分の出庫量をそれぞれ生成して出庫データを作成し(ステップS21)、それを出庫データ記憶部6に記憶させる(ステップS22)。

【0016】シミュレーション部5は、パラメータ記憶部4から発注サイクル及び直近の発注日を読み込み、シミュレーション対象の当日が発注日であるか否かを判断し(ステップS23)、発注日でない場合、後述するステップS24～ステップS26をスキップしてステップS27へ移る。一方、シミュレーション部5は、発注日であると判断した場合、次の(2)式に基づいて発注量を算出する(ステップS24)。

※一タ記憶部7に与え、そこに記憶させる(ステップS26)。

【0018】シミュレーション部5は、出庫データ記憶部6、入庫データ記憶部7及び在庫量推移記憶部8を参照し、次の(3)式に基づいて当日の在庫量を算出し(ステップS27)、それを日付に対応させて在庫量推移記憶部8に与え、そこに記憶させる(ステップS28)。

★庫量決定部9は、在庫量推移記憶部8に記憶してある日々の在庫量から、在庫量閾値以下、即ち品切れであるものを抽出し(ステップS3、S4)、抽出した各在庫量をその値が小さいものから順に並べ替える(ステップS5)。また、適正在庫量決定部9は、予め設定された複数の品切れ率、例えば1%、2%、3%、4%、5%、6%に対して、次の(4)式を満たす最小の整数である係数Tを算出する(ステップS6)。例えば、シミュレーション実施期間が100日であり、品切れ率が5%である場合、係数Tは6である。

40 ☆して発注サイクル内の総出庫量を算出し、それらを次の(6)式に代入して、適正在庫量を算定する(ステップS9)。

値になり、1番目～(T-1)番目の在庫量だけが在庫量閾値以下になる。従って、係数Tに対応する品切れ率以内で在庫管理を実行することができる。このように、

品切れが発生する期間が許容範囲内であって、入庫直後の在庫量が可及的に少い適正在庫量を、1回のシミュレーションを行うだけで短時間に決定することができる。また、シミュレーションにおいて仮の適正在庫量を設定しないため、オペレータの経験に拘らず、適正在庫量を決定することができる。

【0023】そして、適正在庫量決定部9は、前述した如く算定した適正在庫量及び安全在庫量を品切れ率に対応付けて適正在庫量記憶部10に与え、そこに記憶させる（ステップS10）。そして、CPU1は適正在庫量記憶部10に記憶してあるデータを、CRT又は液晶ディスプレイ等の表示部3に表示させる（ステップS11）。

【0024】なお、上述したような適正在庫量決定のコンピュータプログラムは、図1に示したような構成のコンピュータのROMに書き込んでおく以外に、図4に示*

表 1

日付	1	2	3	4	5	6	7	8	...
在庫量(t)	110	108	108	102	98	94	122	120	...

【0027】表2は、シミュレーションによって求めた各在庫量から、品切れした日及びその在庫量を抽出した結果を示すものである。表2から明らかな如く、品切れした日は、5日、6日、31日、...、83日の計9日※

表 2

日付	5	6	31	32	52	68	69	82	83
在庫量	98	94	96	93	96	93	90	99	92

【0029】

【表3】

表 3

配列No	1	2	3	4	5	6	7	8	9
在庫量	90	92	93	93	94	96	96	98	99

【0030】いま、発注サイクル内の総在庫量の平均を24t、品切れ率を5%とすると、係数Tは6であるため、ソート済在庫量配列の6番目の在庫量である96tと、在庫量閾値100tとを（5）式に代入して、安全在庫量4tを得る。そして、（6）式に従って、安全在庫量4tに24tを加えて28tを得、これを品切れ率を5%に対する適正在庫量に決定する。表4に、品切れ率を1%～6%に対する安全在庫量及び適正在庫量の算定結果を示す。

【0031】

【表4】

表 4

品切れ率 %	安全在庫量 t	適正在庫量 t
1	8	32
2	7	31
3	7	31
4	6	30
5	4	28
6	4	28

【0032】表4から明らかな如く、品切れ率の値が大きくなるに従って安全在庫量及び適正在庫量が減少している。

【0033】

【発明の効果】以上詳述した如く、本発明にあつては、オペレータの経験に拘らず、在庫量が閾値より少ない第1期間を第2期間内になすことができる最小の在庫量である適正在庫量を1回のシミュレーションで求めることができ、適正在庫量が短時間で決定される。従つて、複数種類の製品の在庫管理を行う場合、各製品の適正在庫量を短時間で決定することができるため、在庫管理の変更又は調整を容易に行うことができる等、本発明は優れた効果を奏する。

【図面の簡単な説明】

【図1】本発明に係る適正在庫量決定装置の要部構成を示すブロック図である。

【図2】図1に示した適正在庫量決定装置による適正在庫量の決定手順を示すフローチャートである。

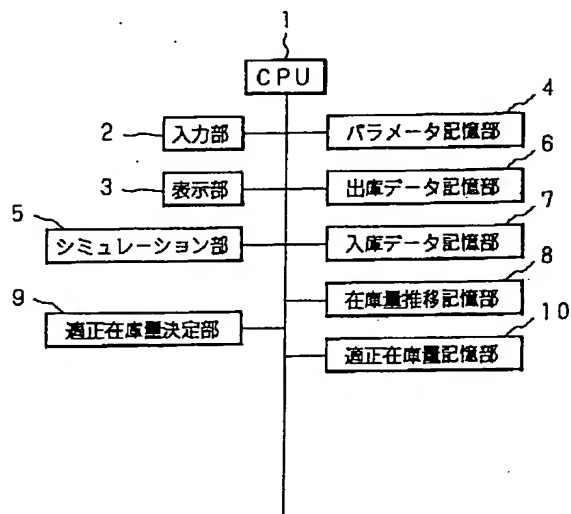
【図3】図1に示したシミュレーション部による在庫量推移の演算手順を示すフローチャートである。

【図4】他の実施の形態を示す模式図である。

【符号の説明】

- 4 パラメータ記憶部
5 シミュレーション部
9 適正在庫量決定部

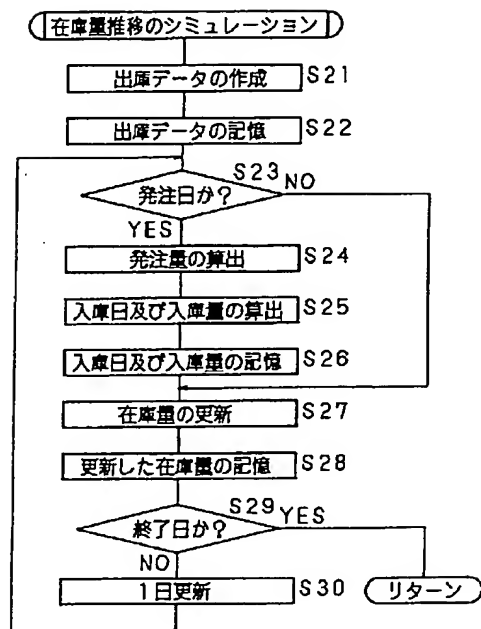
【図1】



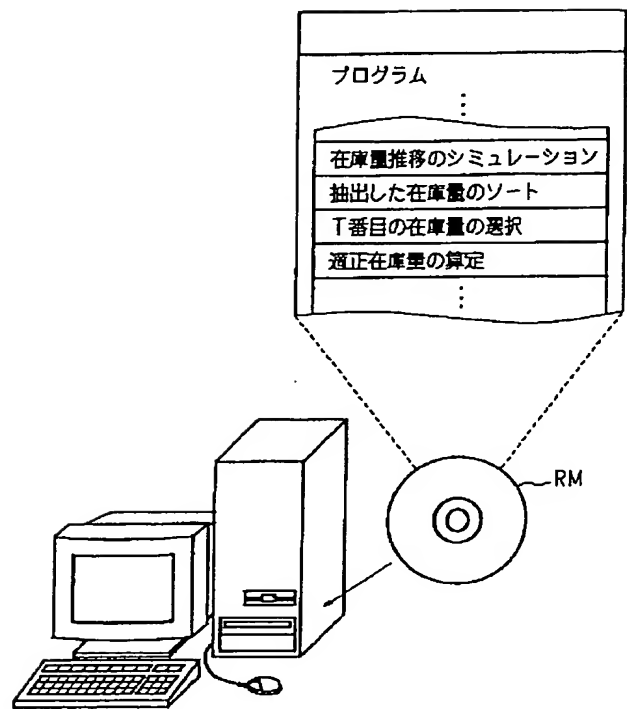
【図2】



【図3】



【図4】



PATENT ABSTRACTS OF JAPAN

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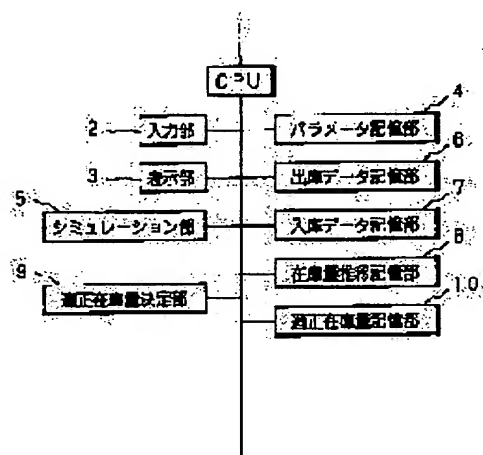
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(54) APPROPRIATE STOCK QUANTITY DECIDING METHOD, APPROPRIATE STOCK QUANTITY DECIDING DEVICE AND RECORD MEDIUM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an appropriate stock quantity deciding method which decides appropriate quantity in a short time regardless of the experience of an operator, a device that is used for the implementation and also a record medium on which its computer program is recorded.

SOLUTION: An appropriate stock quantity deciding part 9 extracts what is \leq stock quantity threshold from daily stock quantity that is recorded on a stock quantity transition storing part 8, rearranges it in order of its small value and on the other hand, calculates a coefficient T. The part 9 respectively calculates the safe stock quantity at each different item shortage rate, also calculates total quantity of delivery of goods from a warehouse in an order cycle by referring to a goods delivery data storing part 6 and calculates appropriate stock quantity by adding both of them.



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3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] The inventory for every unit period set up beforehand is calculated by simulation using the parameter computed from the track record concerning close leaving the garage of a product, respectively. In the approach of determining reasonable inventory quantity that the 1st period fewer than the threshold which the inventory of two or more obtained inventories defined beforehand is searched for, and the 1st acquired period will become within the 2nd period defined beforehand An inventory smaller than said threshold is extracted from two or more inventories obtained by said simulation. While rearranging the extracted inventory into the sequence that the value is small, or descending watch and forming an inventory array The reasonable-inventory-quantity decision approach characterized by asking for a multiplier from the number of the unit periods included at said 2nd period, choosing the inventory of the sequence corresponding to said multiplier from each inventory contained in said inventory array, and determining reasonable inventory quantity using the difference and said track record of the selected inventory and the selected threshold.

[Claim 2] The inventory for every unit period set up beforehand is calculated by simulation using the parameter computed from the track record concerning close leaving the garage of a product, respectively. In the equipment which determines reasonable inventory quantity that the 1st period fewer than the threshold which the inventory of two or more obtained inventories defined beforehand is searched for, and the 1st acquired period will become within the 2nd period defined beforehand A means to extract an inventory smaller than said threshold from two or more inventories obtained by said simulation, A means to rearrange the extracted inventory into the sequence that the value is small, or descending watch, and to form an inventory array, A means to ask for a multiplier from the number of the unit periods included at said 2nd period, and a means to choose the inventory of the sequence corresponding to said multiplier from each inventory contained in an inventory array, Reasonable-inventory-quantity decision equipment characterized by having a means to determine reasonable inventory quantity using the difference and said track record of the selected inventory and the selected threshold.

[Claim 3] The step which makes the inventory for every unit period set up beforehand calculate by simulation using the parameter computed from the track record concerning close leaving the garage of a product, respectively, The step which makes an inventory smaller than the threshold defined beforehand extract from two or more inventories obtained by this simulation, The step in which make the extracted inventory rearranged into the sequence that the value is small, or descending watch, and an inventory array is made to form, The step made to be asked for a multiplier from the number of the unit periods included at this 2nd period that the 1st period which can be found from the number of the extracted inventories should be carried out within the 2nd period defined beforehand, The step as which the inventory of the sequence corresponding to said multiplier is made to choose from each inventory contained in said inventory array, The record medium characterized by having recorded the computer program which has the step which makes reasonable inventory quantity determine using the difference and said track record of the selected inventory and the selected threshold.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the method of determining the reasonable inventory quantity which is the reference value of stock control, and the record medium which is used for the operation and which, and was located in a line and recorded the computer program. [the record medium]

[0002]

[Description of the Prior Art] The period whose product of an inventory responds to the amount of leaving the garage of a product, and places an order for and stocks the product concerned, and is lost in the stock control which manages the inventory of a product and when the so-called run out occurs is within the permissible period when it may approve [the 0th - several] according to the class of product, and it is important that the inventory immediately after warehousing determines small reasonable inventory quantity as much as possible for a short time. The approach of computing reasonable inventory quantity, using the following (1) type as an approach of determining such reasonable inventory quantity is proposed.

Reasonable inventory quantity = $\alpha \sqrt{(L+M) \times \sigma + D}$ -- (1)

α : The order cycle σ which is a period from the lead-time M : product order which is a period from the multiplier L : product order which becomes settled by the run-out period carried out to product warehousing to the next product order permission: Dispersion in the amount of leaving the garage (standard deviation)

D : The amount of average leaving the garage in an order cycle [0003] However, in such a case, by the approach of computing reasonable inventory quantity using such a formula, suitable reasonable inventory quantity was uncomputable regardless of the case where quantity, a stage, etc. of the lead time or close leaving the garage change.

[0004] Therefore, publication number 5-81301 The following approaches are indicated by the number official report. It asks for two or more parameters used for simulation from each track record value, such as quantity of the lead time or close leaving the garage, and a stage. Moreover, temporary reasonable inventory quantity and a simulation implementation period are set up. Based on temporary reasonable inventory quantity and each parameter, transition of an inventory is simulated, the period (it is henceforth called a run out period) when run out occurred is searched for, the run out period over a simulation implementation period comes out from the obtained result comparatively, and a certain rate of run out is computed. the threshold which the computed rate of run out set up beforehand, and abbreviation -- a ***** [being equal] -- judging -- the rate of run out -- a threshold and abbreviation -- when it is judged that it is not equal, the rate of run out is computed by changing temporary reasonable inventory quantity and performing simulation again. such actuation -- the rate of run out -- a threshold and abbreviation -- until it judges that it is equal -- repeating -- the rate of run out -- a threshold and abbreviation -- when it is judged that it is equal, temporary reasonable inventory quantity is determined as reasonable inventory quantity.

[0005]

[Problem(s) to be Solved by the Invention] However, publication number 5-81301 If it is in the approach indicated by the number official report, in order to repeat simulation and to determine reasonable inventory quantity by trial and error, there was a problem of taking long duration to determine reasonable inventory quantity. Moreover, in order that an operator may set up a suitable value experientially based on each track record value mentioned above, when experience is a shallow operator, it takes a long time further for the temporary reasonable inventory quantity used for simulation to determine reasonable

inventory quantity.

[0006] While this invention is made in view of this situation, the place made into the purpose rearranges an inventory smaller than the threshold of two or more inventories obtained by simulation into the sequence that the value is small, or descending watch and an inventory array is formed From each inventory which asks for a multiplier from the number of the unit periods included at the 2nd period, and is contained in an inventory array Choose the inventory of the sequence corresponding to said multiplier, and by determining reasonable inventory quantity using the track record concerning the difference of the selected inventory and the selected threshold, and close leaving the garage Even when quantity, a stage, etc. of the lead time or close leaving the garage change, irrespective of experience of an operator It is in offering the reasonable-inventory-quantity decision approach that reasonable inventory quantity can be determined in a short time and the equipment which uses it for the operation, and the record medium with which the computer program is recorded on the list.

[0007]

[Means for Solving the Problem] The parameter computed from the track record concerning close leaving the garage of a product is used for the reasonable-inventory-quantity decision approach concerning the 1st invention. The inventory for every unit period set up beforehand is calculated by simulation, respectively. In the approach of determining reasonable inventory quantity that the 1st period fewer than the threshold which the inventory of two or more obtained inventories defined beforehand is searched for, and the 1st acquired period will become within the 2nd period defined beforehand An inventory smaller than said threshold is extracted from two or more inventories obtained by said simulation. While rearranging the extracted inventory into the sequence that the value is small, or descending watch and forming an inventory array It is characterized by asking for a multiplier from the number of the unit periods included at said 2nd period, choosing the inventory of the sequence corresponding to said multiplier from each inventory contained in said inventory array, and determining reasonable inventory quantity using the difference and said track record of the selected inventory and the selected threshold.

[0008] The parameter computed from the track record concerning close leaving the garage of a product is used for the reasonable-inventory-quantity decision equipment concerning the 2nd invention. The inventory for every unit period set up beforehand is calculated by simulation, respectively. In the equipment which determines reasonable inventory quantity that the 1st period fewer than the threshold which the inventory of two or more obtained inventories defined beforehand is searched for, and the 1st acquired period will become within the 2nd period defined beforehand A means to extract an inventory smaller than said threshold from two or more inventories obtained by said simulation, A means to rearrange the extracted inventory into the sequence that the value is small, or descending watch, and to form an inventory array, It is characterized by having a means to ask for a multiplier from the number of the unit periods included at said 2nd period, a means to choose the inventory of the sequence corresponding to said multiplier from each inventory contained in an inventory array, and a means to determine reasonable inventory quantity using the difference and said track record of the selected inventory and the selected threshold.

[0009] The step which makes the inventory for every unit period set up beforehand calculate by simulation using the parameter computed from the track record which the record medium concerning the 3rd invention requires for close leaving the garage of a product, respectively, The step which makes an inventory smaller than the threshold defined beforehand extract from two or more inventories obtained by this simulation, The step in which make the extracted inventory rearranged into the sequence that the value is small, or descending watch, and an inventory array is made to form, The step made to be asked for a multiplier from the number of the unit periods included at this 2nd period that the 1st period which can be found from the number of the extracted inventories should be carried out within the 2nd period defined beforehand, It is characterized by having recorded the computer program which has the step as which the inventory of the sequence corresponding to said multiplier is made to choose, and the step which makes reasonable inventory quantity determine using the difference and said track record of the selected inventory and the selected threshold from each inventory contained in said inventory array.

[0010] If it is in this invention, using the parameter computed from the track record concerning close leaving the garage of a product, the inventory for every unit period set up beforehand is calculated by simulation, respectively, and an inventory smaller than a threshold is extracted from two or more obtained inventories. When performing simulation, temporary reasonable inventory quantity asks for transition of the inventory by close leaving the garage, without setting up. Therefore, simulation can be quickly performed irrespective of experience of an operator.

[0011] The extracted inventory is rearranged into the sequence that the value is small, or descending

watch that the 1st period (run out period) which carries out the multiplication of the unit period to the number of the extracted inventories, and can be found should be carried out within the 2nd period (permissible period) defined beforehand, an inventory array is formed, and a necessary inventory is chosen from two or more inventories contained in an inventory array as follows. For example, when it rearranges into the sequence that the value of an inventory is small, the value which totaled the unit period n times asks for the minimum multiplier n exceeding the 2nd period (permissible period) defined beforehand, and chooses the n -th inventory from a head.

[0012] The difference of the selected inventory and the selected threshold is computed and the inventory which added it to the amount of leaving the garage after a product is stocked until a product is stocked next, and was obtained is determined as reasonable inventory quantity. When this reasonable inventory quantity performs stock control, the n -th inventory becomes a bigger value than a threshold from the head of an inventory array. Thus, the reasonable inventory quantity which is the minimum inventory to which an inventory can make periods fewer than a threshold within a permissible period can be calculated in one simulation, and reasonable inventory quantity is determined for a short time.

[0013]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is concretely explained based on a drawing. Drawing 1 is the block diagram showing the important section configuration of the reasonable-inventory-quantity decision equipment concerning this invention, and drawing 2 R> 2 is a flow chart which shows the decision procedure of the reasonable inventory quantity by the reasonable-inventory-quantity decision equipment shown in drawing 1. The simulation implementation period from the input sections 2, such as a keyboard or a mouse, the lead time, If two or more parameters calculated from each track record value, such as quantity of close leaving the garage and a stage, the inventory at the time of simulation initiation (current inventory), an order cycle, the latest date of order, etc. are inputted CPU1 gives them to the parameter storage section 4, and memorizes them there -- making (step S1) -- the simulation section 5 is started and transition of an inventory is made to calculate (step S2)

[0014] Based on two or more track record values, it asks for each parameter mentioned above as follows. It asks for the ratio of the order quantity of a product and the amount of warehousing which carried out multiple-times order, respectively, and the average and standard deviation of a ratio for which it asked are computed, and let them be the amount parameters of warehousing. Moreover, an average and standard deviation of a period after ordering a product until it stocks are computed, and let them be warehousing timing (lead time) parameters. On the other hand, the average and standard deviation of the amount of leaving the garage of a product which carried out multiple-times leaving the garage are computed, and let them be the amount parameters of leaving the garage. Moreover, an average and standard deviation of the count of leaving the garage within the unit period of stock control are computed, and let them be leaving-the-garage timing parameters.

[0015] Drawing 3 is a flow chart which shows the operation procedure of inventory transition by the simulation section 5 shown in drawing 1, and shows the case where it is based on the periodic recordering method which places an order for a product periodically. The simulation section 5 reads a leaving-the-garage timing parameter from the parameter storage section 4, generates a random number within the average and standard deviation, and generates two or more unit periods of every contained at a simulation implementation period, and the daily count of leaving the garage. And the simulation section 5 generates the daily amount of leaving the garage for the count of leaving the garage using the amount parameter of leaving the garage which read the amount parameter of leaving the garage, and was read, respectively from the parameter storage section 4, creates outbound data (step S21), and makes the outbound data storage section 6 memorize it (step S22).

[0016] The simulation section 5 reads an order cycle and the latest date of order from the parameter storage section 4, and judges whether that day for simulation is the date of order (step S23), and when it is not the date of order, it skips step S24 mentioned later - step S26, and it moves from it to step S27. On the other hand, when it is judged that the simulation section 5 is the date of order, an order quantity is computed based on the following (2) types (step S24).

(Order quantity) = (the amount of prediction leaving the garage from the date of order to a warehousing day) - (current inventory)

- Amount [of an ordered product / of un-stocking] + (inventory threshold) -- (2)

However, an inventory threshold: Sufficient big value beforehand set up so that an inventory might not become negative [0017] The simulation section 5 reads the amount parameter of warehousing, and a

warehousing timing parameter from the parameter storage section 4, it matches the amount of warehousing and the warehousing day which computed and (step S25) computed the warehousing day

based on the warehousing timing parameter while computing the amount parameter of warehousing to the order quantity computed using (2) types, and the amount of warehousing, gives it to the inbound-data storage section 7, and makes memorize there (step S26).

[0018] The simulation section 5 computes an inventory on the day based on the following (3) types (step S27), makes it correspond to the date with reference to the outbound data storage section 6, the inbound data storage section 7, and the inventory transition storage section 8, is given to the inventory transition storage section 8, and is made to memorize there (step S28).

(Inventory on the day) = (inventory the previous day) - (amount of leaving the garage on the day) + (the amount of warehousing on the day)

-- (3)

[0019] The simulation section 5 judges whether it is the end date of a simulation period (step S29), when that is not right, will update the date on the 1st and will return to ** (step S30) and step S23. The simulation section 5 calculates transition of the inventory in a simulation period by repeating actuation to step S24 - step S30 until it judges that it is the end date of a simulation period at step S23.

[0020] Thus, if transition of an inventory is obtained, CPU1 will start the reasonable-inventory-quantity decision section 9. From the daily inventory memorized in the inventory transition storage section 8, the reasonable-inventory-quantity decision section 9 extracts what is below an inventory threshold, i.e., run out, (step S3, S4), and rearranges each extracted inventory sequentially from a thing with the small value (step S5). Moreover, the reasonable-inventory-quantity decision section 9 computes the multiplier T which is the minimum integer with which the following (4) types are filled to two or more rates of run out set up beforehand, for example, 1%, 2%, 3%, 4%, 5%, and 6% (step S6). For example, a multiplier T is 6, when a simulation implementation period is 100 days and the rate of run out is 5%.

$\text{min. } T > (\text{simulation implementation period}) \times (\text{rate of run out})$ -- (4)

However, T: Integer [0021] the reasonable-inventory-quantity decision section 9 -- the following (5) types -- being based -- the exception of each rate of run out -- the amount of safety stock -- respectively -- computing (step S8) -- with reference to the outbound data storage section 6, the total amount of leaving the garage in an order cycle is computed, they are substituted for the following (6) types, and reasonable inventory quantity is calculated (step S9).

= (inventory threshold) (The amount of safety stock) - (Tth inventory of a sorted inventory array) -- (5)
(Reasonable inventory quantity) = (amount of safety stock) + (Taira ** of the total amount of leaving the garage in an order cycle) -- (6)

[0022] (5) When stock control is performed with the reasonable inventory quantity calculated using the amount of safety stock calculated by the formula, the Tth inventory of a sorted inventory array becomes a larger value than an inventory threshold, and only the inventory of eye the 1st watch [- (T-1)] becomes below an inventory threshold. Therefore, stock control can be performed within the rate of run out corresponding to a multiplier T. Thus, the period when run out occurs is in tolerance, and the inventory immediately after warehousing can determine small reasonable inventory quantity in a short time only by performing one simulation as much as possible. Moreover, since temporary reasonable inventory quantity is not set up in simulation, reasonable inventory quantity can be determined irrespective of experience of an operator.

[0023] And the reasonable-inventory-quantity decision section 9 matches with the rate of run out the reasonable inventory quantity and the amount of safety stock which were calculated as mentioned above, gives them to the reasonable-inventory-quantity storage section 10, and is made to memorize there (step S10). And CPU1 displays the data memorized in the reasonable-inventory-quantity storage section 10 on the displays 3, such as CRT or a liquid crystal display, (step S11).

[0024] In addition, the computer program of reasonable-inventory-quantity decision which was mentioned above may be the configuration of recording on the record media RM, such as a compact disk or a flexible disk, loading with and loading this record medium RM to the disk drive of a computer, and making reasonable inventory quantity determining besides writing in ROM of the computer of a configuration as shown in drawing 1 as shown in drawing 4.

[0025]

[Example] Next, the result of having enforced the approach concerning this invention is explained. By simulation, the next table 1 shows a part of result of having asked for transition of an inventory, and set up 100 as an inventory threshold. The inventory of a value smaller than the inventory threshold 100, i.e., the day of run out, has occurred a number of days so that clearly from Table 1. In addition, a simulation implementation period is 100 days.

[0026]

[Table 1]

表 1

日付	1	2	3	4	5	6	7	8	...
在庫量(t)	110	108	108	102	98	94	122	120	...

[0027] Table 2 shows the result of having extracted the sold-out day and its inventory from each inventory calculated by simulation. The sold-out days were -- and a total of nine days on the 83rd on five days, six days, and the 31st so that clearly from Table 2. If an inventory rearranges this into little sequence, a sorted inventory array as shown in Table 3 will be acquired.

[0028]

[Table 2]

表 2

日付	5	6	31	32	52	68	69	82	83
在庫量	98	94	96	93	96	93	90	99	92

[0029]

[Table 3]

表 3

配列No	1	2	3	4	5	6	7	8	9
在庫量	90	92	93	93	94	96	96	98	99

[0030] If the total amount of leaving the garage in an order cycle is averaged as 24t and the rate of run out is now averaged into 5%, since a multiplier T is 6, it will substitute for (5) types 96t which is the 6th inventory of a sorted inventory array, and the inventory threshold of 100t, and will obtain the amount of safety stock of 4t. And according to (6) types, 24t is added to the amount of safety stock of 4t, 28t is obtained, and this is determined as reasonable inventory quantity [as opposed to 5% for the rate of run out]. The calculation result of the amount of safety stock and reasonable inventory quantity is shown in Table 4. [as opposed to 1% - 6% for the rate of run out]

[0031]

[Table 4]

表 4

品切れ率 %	安全在庫量 t	適正在庫量 t
1	8	32
2	7	31
3	7	31
4	6	30
5	4	28
6	4	28

[0032] The amount of safety stock and reasonable inventory quantity are decreasing as the value of the rate of run out becomes large so that clearly from Table 4.

[0033]

[Effect of the Invention] If it is in this invention as explained in full detail above, irrespective of experience of an operator, the reasonable inventory quantity which is the minimum inventory to which an inventory can make the 1st period fewer than a threshold within the 2nd period can be calculated in one simulation, and reasonable inventory quantity is determined for a short time. Therefore, since the reasonable inventory quantity of each product can be determined in a short time when performing stock control of two or more kinds of products, this invention does the outstanding effectiveness so -- modification or adjustment of stock control can be performed easily.

[Translation done.]

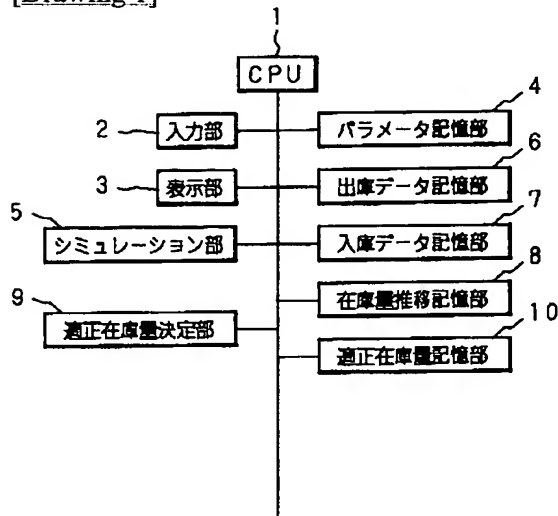
* NOTICES *

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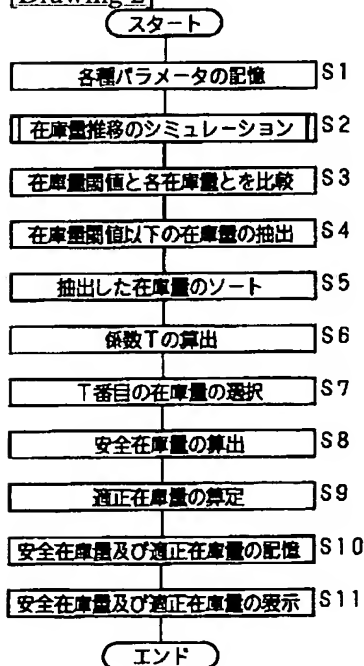
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

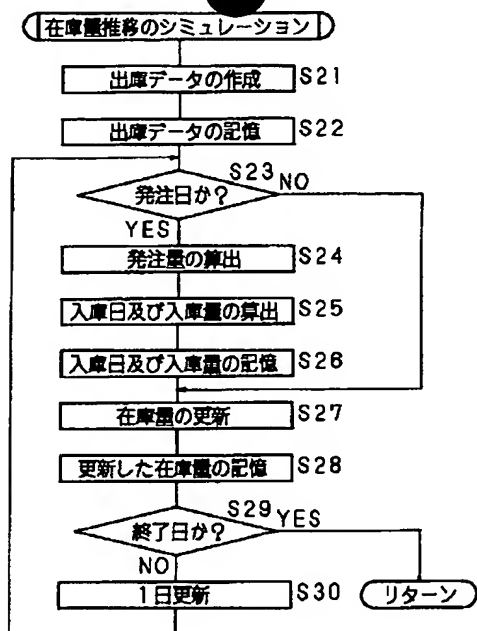
[Drawing 1]



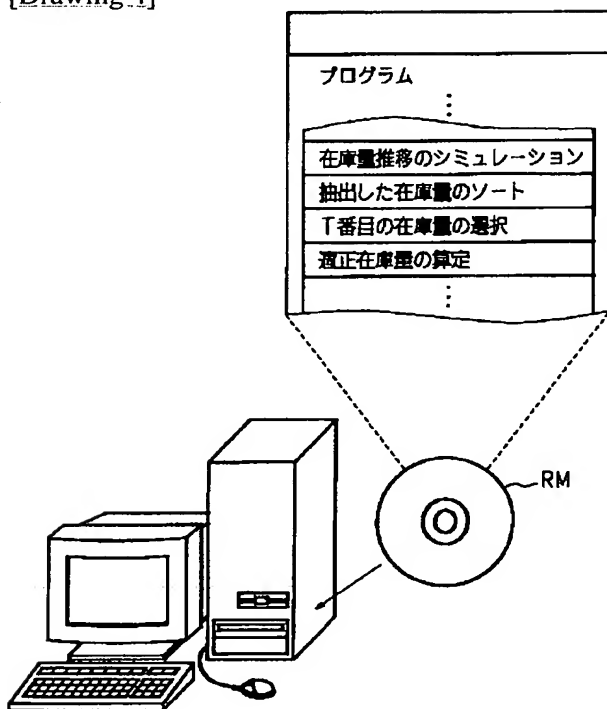
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]